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20 YEARS OF PROGRESS IN RURAL TELEPHONE SERVICE



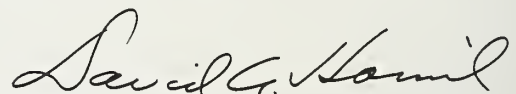
Breaking the Communications Barrier
Between Rural America and the World

Foreword

On October 28, 1969, the Rural Electrification Administration observed the 20th Anniversary of its rural telephone program. What have been the benefits of this endeavor? As in the rural electrification program, there is no way to measure, so great has been its impact on the way of life in Rural America. Who can determine, for example, the value of a telephone call, say from son to mother, or a call that saves a human life?

Measurements aside, today more than 80 percent of our Nation's farms have modern telephone service—much of it provided through self-liquidating REA loans. Rural people wanted service and needed service for many years. Now they can have it, because rural people possessed the imagination, the determination and the ability to work with their Government in carrying out their shared responsibility of service to rural areas.

Their progress has also been marked by close, mutually beneficial working relationships with the telephone industry and telephone equipment manufacturers. Some of the products of their joint effort include: Extended Area Service, which enables subscribers in a combined community of interest to dial each other direct without tolls; the interconnection of all types of systems for toll calls; procedures for sharing revenues from toll calls; and joint use of facilities with electric suppliers. REA specifications for the design of telephone equipment are recognized as standards throughout the industry, and construction techniques pioneered by REA have helped keep the cost of telephone service down for all rural people.



David A. Hamil, Administrator
Rural Electrification Administration

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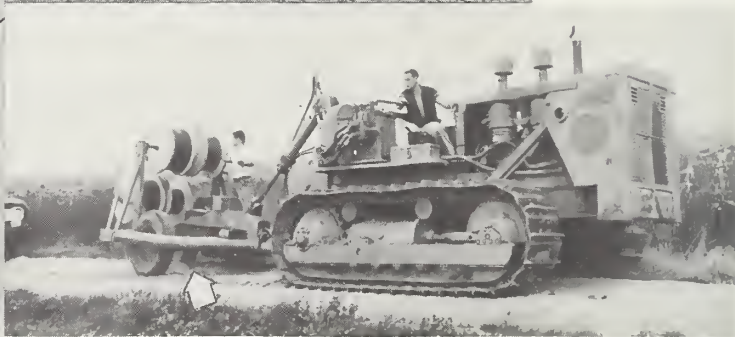
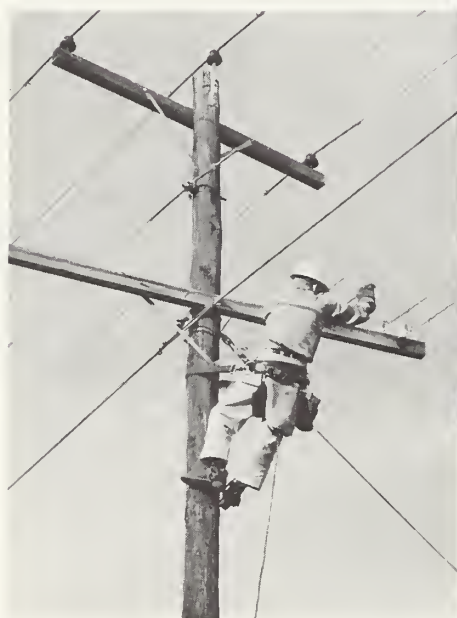
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20 YEARS OF PROGRESS IN RURAL TELEPHONE SERVICE



"Mr. Watson, Come Here . . ."

Alexander Graham Bell first conceived the principle of telephone transmission in 1874, when he was only 27. He stated it this way:

"If I could make a current of electricity vary in intensity precisely as the air varies in density during the production of sound, I should be able to transmit speech telegraphically."

The following year, while working on another of his inventions, Bell heard the twang of a steel spring over an electric wire. He and his assistant, Thomas A. Watson, knew that the current transmitting that sound was strong enough to be useful. Bell gave Watson instructions for making the

first telephone, and it transmitted speech sounds the next day.

On March 18, 1876, in Boston, they produced an instrument that carried the famous sentence: "Mr. Watson, come here, I want you." With those words, the telephone industry was born.

For the next two decades, until the Bell patents expired in 1894, the development of telephony was confined largely to cities. After the basic patents were released, the independent telephone industry began to develop throughout rural America. Both manufacturing and service organizations turned to the rural market. One company came out with a manual which told farmers how to develop their own telephone systems on a mutual or cooperative basis. Many farmer lines and mutual systems were developed during succeeding years.

Two forms of organizations were popular in rural areas. There were "pure" mutuals, or nonstock "club" lines, usually without switchboard service; there also were mutuals, which operated switchboards and generally were organized as capital stock companies. In addition, there were a number of small, family-owned companies which supplied rural service. By 1912, the number of rural telephone lines and systems had grown to more than 32,000 and the U.S. telephone industry included several manufacturers who specialized in the production of rural telephones.

The most common telephone instrument was the magneto set. It was a big contraption that usually hung on the wall, and often there were 20 or more subscribers hooked to the same grounded magneto circuit. To make a call, you first turned the generator crank a couple of times. This activated a "drop" in the operator's switchboard, signaling her that you wanted to make a call. She plugged into your line, you lifted the re-



A farmer rings "Central" on his ancient magneto phone.

ceiver and told her the number you wanted.

Private conversations, so important to subscribers today, were out of the question along the magneto line. But that didn't worry the users. Rural people looked upon the telephone as a news medium as well as a communications device. On many systems, "Central," as the operator was called, was the forerunner of the modern radio and television newscaster. Here and there, she rang all lines at seven o'clock each evening to report the correct time, the weather forecast, market quotations, sports results, and local and international news. She answered questions; she ran a locator service; she was the local message center. But the service was limited; as a rule, there was no operator on duty at night.

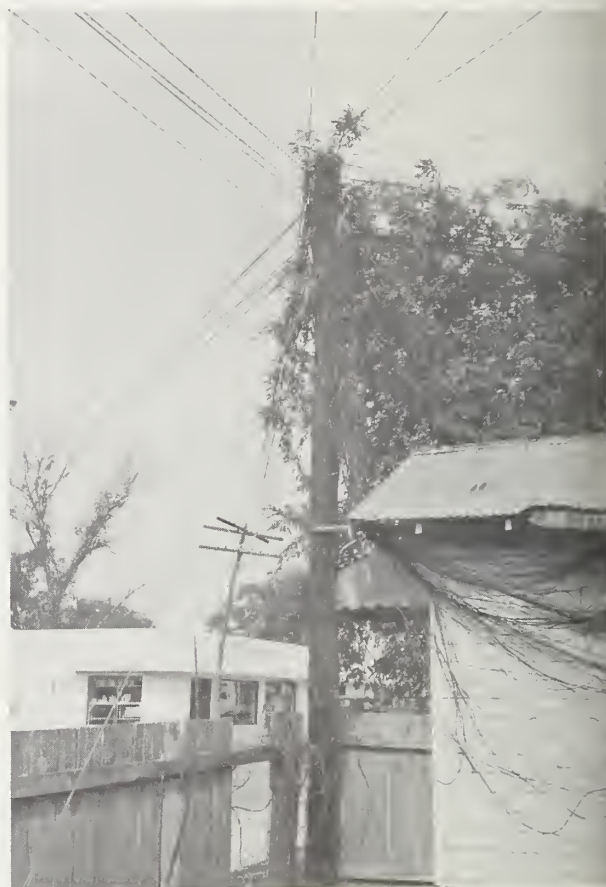
While a lot of people called their telephones "whoop and holler" sets, the truth is that they gave pretty good service when the lines were in good condition. Magneto systems continued to give some sort of service even after years of neglect, even though lines often ran from fence posts to dead trees and sometimes through fence wire. Even with no maintenance at all—with the wire hanging on the ground and falling off the insulators—you might still hear what your friend had to say if he shouted loudly enough.

After World War I, the number of farmer lines continued to grow. By 1927, when the high point was reached, there were some 60,000 mutual systems and other telephone organizations in the United States. But during the same period, the systems were deteriorating. Many failed to keep adequate accounts; a number of people were lax about paying bills; there were few maintenance men and little maintenance. Poor service became widespread in rural America.

With the depression of the thirties, lines went from bad to worse. Most mutuals stayed in business, however. They limped along, with operators sticking to their jobs despite low pay. Farmers kept trying to make calls, and occasionally they got through. Many lines deteriorated out of existence.

After the creation of the Rural Electrification Administration in 1935, electric lines

"Central" was a rural institution. Her board was crowded with messages—for the doctor, the lawyer, the sheriff. In a routine day, she might announce the birth of a baby, give first aid advice, and locate a couple of wandering children. This is Gladys Hanscom, Poland Telephone Company, Poland Springs, Maine.



A hopeless tangle of wires enters the building housing the old manual board of the East Ascension Telephone Company, in Gonzales, Louisiana. REA financing helped replace this system with modern dial.

Wire on old magneto line is hooked to fence, evidence that some farmers talked through their barbed wire fences.

frequently produced noise on grounded telephone lines, and further reduced their usefulness. Many a small magneto system either had to go out of business or revamp its plant.

By World War II, it was clear that rural telephone systems had reached an impasse. Farmer systems, which had started so hopefully at the turn of the century, were just about finished. Rates were low and most of the old systems fell apart. There was no replacement capital. Actually, there were fewer farmers with telephones in 1940 than there had been in 1920.

Many cities, on the other hand, were enjoying automatic dial service by 1940. It was clear to many telephone people that the only way farmer lines would ever be made serviceable would be to eliminate the one-wire grounded service. But this presented a need for large amounts of capital which were not generally available to the smaller companies. The farmer mutuals and other companies, with their poor financial history, were in no position to borrow money.

Some people, even in the thirties, thought that the Government would have to lend a hand. In 1939, John M. Carmody, then REA Administrator, wrote an editor in North Carolina:

"Personally, I have long felt that there was a real opportunity for constructive assistance to rural people in the idea of Federal financing of farm telephone lines. It seems to me that rural people have just as much right to up-to-date communication as they have to modern power. There's no question in my mind but that Government assistance will be required if the job is ever to be completed."

Others agreed. In late 1944, Representative W. R. Poage of Texas introduced a bill to establish a Rural Telephone Administration, modeled after the already successful Rural Electrification Administration. Starting in 1945, both Representative Poage and Senator Lister Hill of Alabama introduced measures in each session of Congress to establish rural telephone loan programs.

Action came in 1949 on bills to amend the Rural Electrification Act. Extensive hearings were held on the Poage bill in the House and on the Hill bill in the Senate. The latter measure had the sponsorship of a bipartisan group of 10 other Senators.

During hearings, many witnesses testified to both the need and demand for rural telephones, for "area coverage," for a source of long-term financing to permit the change from magneto to dial. It was pointed out that only about 38 percent of U.S. farms had any form of telephone service. It was shown that rural service was obsolete in many places, and that private and public agencies had failed to make long-term, low-cost credit available.

Before the Senate Committee, REA Administrator Claude R. Wickard testified that farmers needed adequate telephone service even more than city people did.

He said: "With the possible exception of electric power, it is hard to conceive of anything that means more to the health, happiness, and economic wellbeing of farm people than good telephone service."

Everett C. Weitzell, who then served REA as Program Analyst and is currently Deputy Administrator, told the House Committee: "For conducting his business, for protecting the health and welfare of his family, and for carrying out every phase of his economic and social life, the farmer must cover greater

distances than urban people. Just as good roads and the automobile placed rural people on a higher level of economic efficiency and living, so electricity and telephones represent additional service that rural America cannot afford to be without."

Some witnesses for the telephone industry, on the other hand, thought that a Federal telephone loan program would be unnecessary and unwise. Several thought REA would be unqualified to function in the telephone field, with which the agency had had no experience. Others emphasized possible dangers in telephone loans to public bodies, and they raised the prospect of federally financed competition with existing facilities. They pointed at possible duplication of lines.

These objections were considered carefully, and changes in the original bills were adopted by both the House and Senate. Changes affirmed the jurisdiction of State regulatory commissions over REA telephone borrowers and eliminated public bodies as possible recipients of telephone loans. Another change gave a preference to existing telephone organizations.

But the view of the bill's sponsors—that rural systems needed some sort of long-term financing if they were to survive—won out. The telephone amendments to the Rural Electrification Act of 1936 were passed by the Congress and signed into law on October 28, 1949.



Rural people turned out for the dial cutover celebration of the Fredericksburg and Wilderness Telephone Company, Chancellor, Virginia, which placed the first REA-financed telephone facilities in service in September 1950.

Capital Becomes Available

The new legislation made the telephone loan program the responsibility of REA, which had been created in 1935 to finance rural electric systems. In the preamble, it was declared to be the policy of Congress "that adequate telephone service be made generally available in rural areas . . . to the widest practicable number of rural users of such service," thereby extending REA's now famous "area coverage" principle to the new telephone program. The term "rural area" was defined as any area not included within a town or village having a population of more than 1,500.

The REA Administrator was authorized to make self-liquidating loans, at an interest rate of 2 percent for a period up to 35 years, for the extension and improvement of rural telephone service.

The new program began with a staff of



three people—an engineer, an information specialist, and a secretary. Their job was to answer inquiries sparked by the new legislation. It wasn't long before the trio learned that nobody knew all the answers.

Should REA make 100 percent loans? If not, what equity should be required? Should loans be made for the full 35 years required by law? How could area coverage be accomplished? REA and the USDA legal staff had to find answers to many difficult questions before the program could go into operation.

Also, REA faced the job of assembling a trained technical staff. Telephone technicians were trained by and large by the Bell System, and by telephone equipment manufacturers. In the postwar building boom, telephone companies and equipment makers were also recruiting trained men. Competition for personnel was keen.

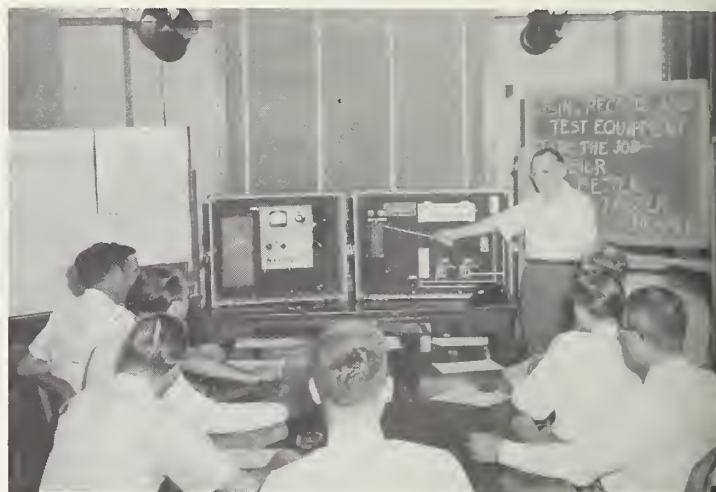
REA gradually employed from the industry, and transferred personnel from its electric loan program to provide a nucleus of a telephone staff. The services of a number of retired Bell employees also were acquired on a consulting basis. By June 1950, when the program was less than a year old, there were 142 full-time employees in the telephone program.

The top men at REA undertook a formidable task of self-education, formulating policy, and working out loan procedures. They knew that sound financing would depend upon how well they solved a number of pressing problems. For one thing, many existing farmer mutuals were too small to handle the cutover to dial operation. They would have to merge or consolidate with other small systems in order to establish more efficient operating units. Many new cooperative and commercial systems were formed in this fashion.

REA recognized that commercial companies already in the business had a preference to loan funds under the Act, and would need to participate in the program if it was to be a success. Most of the rural areas had already been assigned to them by authority of state regulatory bodies.

Because dial service eliminated manual operations, because of the convenience of automatic dial switching, and because of the generally better service it afforded, REA

Employees learn the intricacies of rural telephony. An REA engineer explains the operation of a wire chief's test set. Small family owned telephone companies (bottom) turned to REA for the financing they needed. Owner-operators of Breezewood Telephone Co. (Pa.) are father, mother and son.





decided to make loans to finance only dial service. The agency also decided that the service must be at least 8-party service.

REA had to find a way to estimate the market for telephone service in each area. Acceptable construction and equipment standards had to be written. Finally, the agency had to develop procedures for determining that each loan would serve the widest practicable number of rural users. It had to develop feasibility standards. It had to assure rural subscribers of adequate service at reasonable rates.

In making loans for refinancing and acquisitions, REA required that applicants justify loan applications in terms of the amount of rural expansion and development which would result. Loan funds for acquisitions were generally limited to the REA-appraised value, with borrowers contributing as equity capital any excess in acquisition cost over the REA appraisal.

While the principal purpose of any REA telephone loan is to serve rural areas, REA approves loans without regard to geographical location when it is determined by the Administrator to be necessary in order to furnish or improve telephone service in rural areas.

REA financing accelerated a trend which was already beginning to make good business sense. The telephone industry had been moving toward a pattern of service which reached out of towns to include the surrounding countryside. Although the cost of rural telephone construction in thinly settled areas was high, REA borrowers found that they could achieve satisfactory operating margins by combining the rural areas with the associated town and community centers. It also did not make sense economically to have two systems—one serving the town and the other serving rural areas. Telephone systems must be designed to serve “communities of interest.”

Joint-use of poles with electric suppliers is one cost-cutter used by rural telephone systems. Automatic dial systems (bottom) became available to rural subscribers, giving them a direct line with the outside world.

Modernizing a Rural Telephone System

As growth capital became available through the REA program, rural telephone systems used it to update their facilities. People in some unserved areas formed cooperatives. Engineering breakthroughs helped reduce the cost of many modernizing innovations.



A.



D.



E.

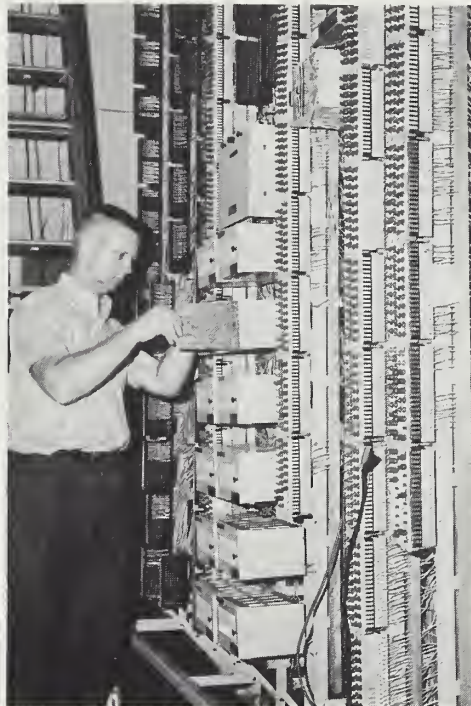
- A. Specially designed equipment plows, buries and covers underground cables in one operation.
- B. Unsightly overhead lines . . .
- C. . . are buried with only a marker to show where.
- D. Fully-automated dial central offices replace the old manual switchboard.
- E. Inside, rows of automatic dial equipment . . .
- F. . . and subscriber carrier circuits perform their functions unattended.
- G. Where communications lines once had to march over rugged mountains . . .
- H. . . now in many areas subscribers' voices are beamed electronically over them.



B.



C.



F.



G.



H.


Breaking the Barrier

Working for REA proved a new kind of experience for telephone technicians and engineers. They were charged with developing a new and specialized telephone technology suited to small rural systems in sparsely settled areas. Their prime assignment was to lower construction costs so that the loan dollar would serve more people. They did.

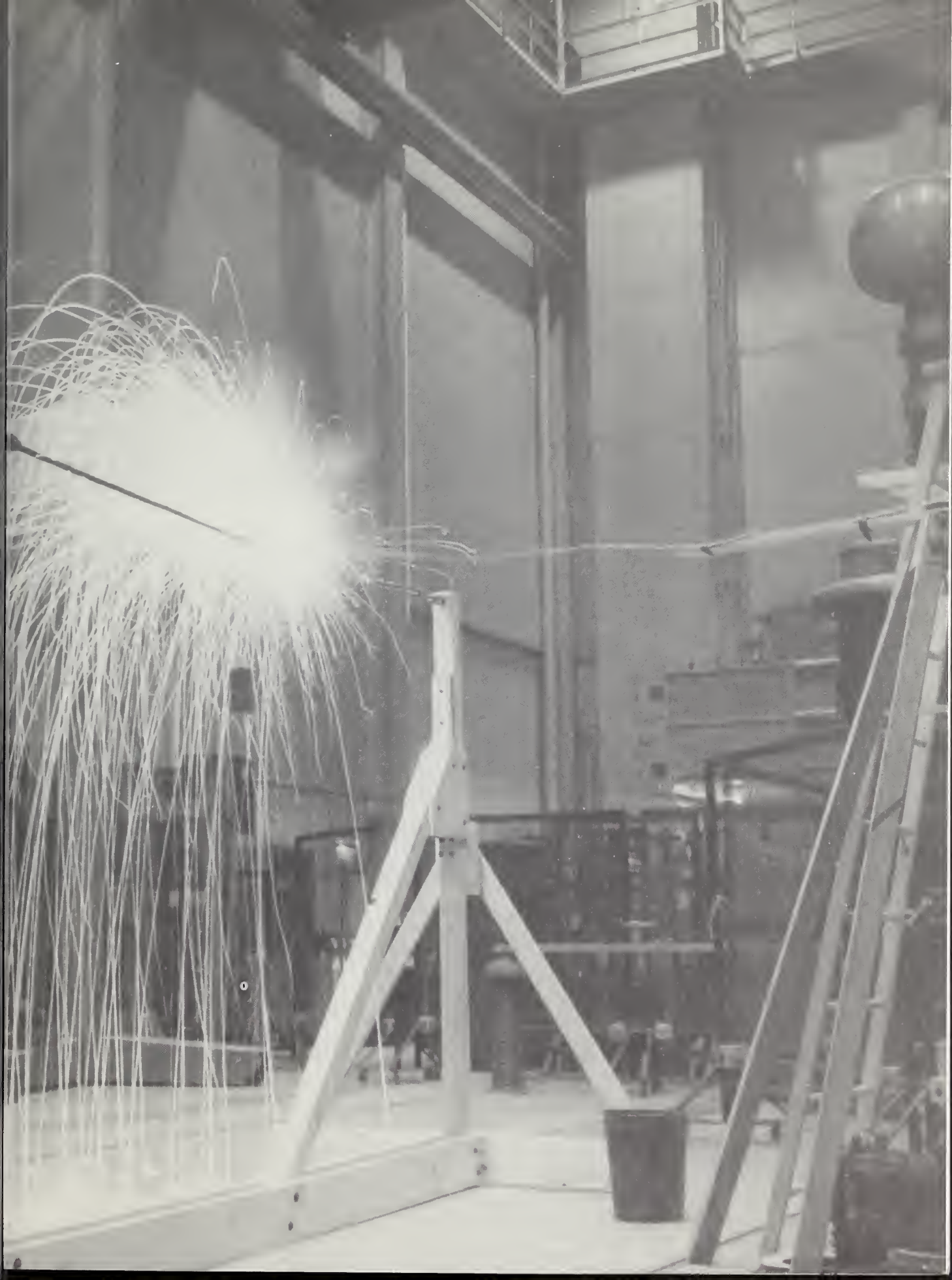
Job number one was to take a critical look at existing telephone technology and sort out those concepts useful for rural dial system construction. Then came the task of developing new concepts of telephone design, engineering, manufacturing, construction and testing.

REA set up a small group of engineers to insure that all products and materials used on borrowers' systems met acceptable specifications. Sometimes there were no industry specifications available, and REA staff engineers had to establish them. Borrowers cooperated by permitting field tests of new materials on their systems.

- The engineers helped to develop construction assembly units for all telephone plant items, permitting contractors to bid competitively on the construction of borrowers' telephone plant.
- They developed standard performance technical specifications for automatic dial switching equipment, enabling equipment makers to bid on central office equipment on a truly competitive basis. This standardization provided REA borrowers with central office equipment at the lowest possible cost.
- They conducted a series of engineering symposiums to interest firms in providing services to borrowers and to help train engineering personnel. As a result, some 100 engineering firms entered the rural telephone field. To date these firms have been responsible for engineering more than 500,000 miles of telephone lines on borrowers' systems.



Simulated high-voltage
power line falling on a
telephone line to deter-
mine the effectiveness of
borrowers' station protec-
tor equipment.



- They played a key role in the development of plastic-insulated cable for rural use. Agency representatives worked with the rest of the industry in standardizing a color code for cable wire pairs, making it easier to splice cable and to locate a particular wire pair inside a cable.

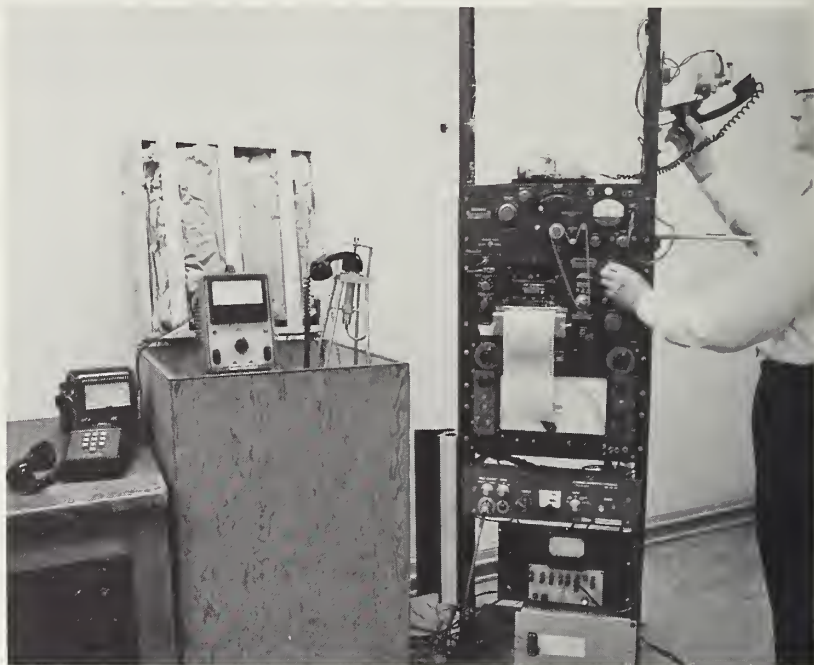
- They helped develop a new plastic cable and wire suitable for burial in the ground. Now a complete line of terminals, pedestals, and other equipment permits the construction of whole systems underground, where they cannot be harmed by tornado, ice or hurricane. Today more than 80 percent of all new telephone construction financed by REA is for buried plant.

- They also have done pioneer work in microwave, beaming telephone messages to hard-to-reach locations; in mobile dial telephones, giving doctors, police, and others 24-hour automobile telephone service; and in long-span construction, which cannot be destroyed by heavy ice storms.

- They were up front in developing the "subscriber carrier" technique, which permits as many as 8 or 10 conversations simultaneously over 1 subscriber line—a tremendous savings in construction costs.

Carrier circuits are flexible, relatively inexpensive, quiet, and provide quality talking paths.

Telephone industry research already points to exciting new developments on the horizon, such as circuits which carry more messages at the same time, and high-speed electronic switching. Telephone instruments are being redesigned; home and farm inter-communication systems are coming into use.



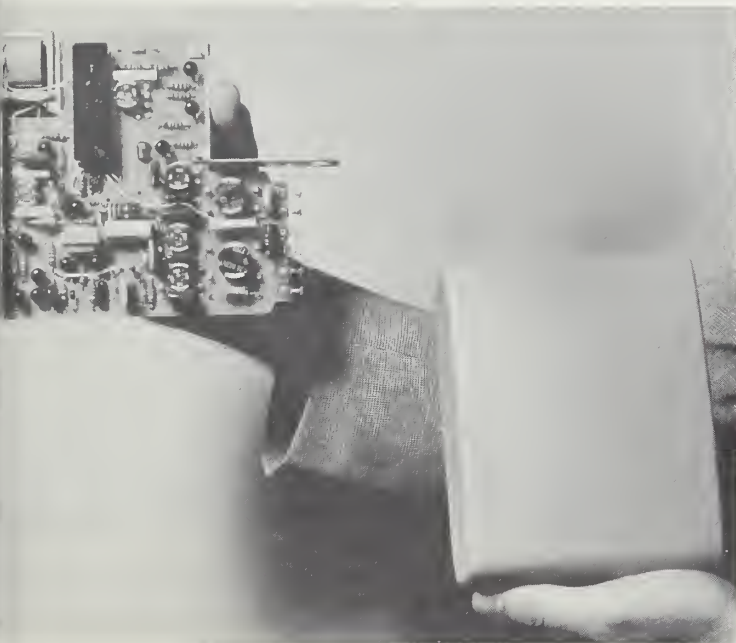
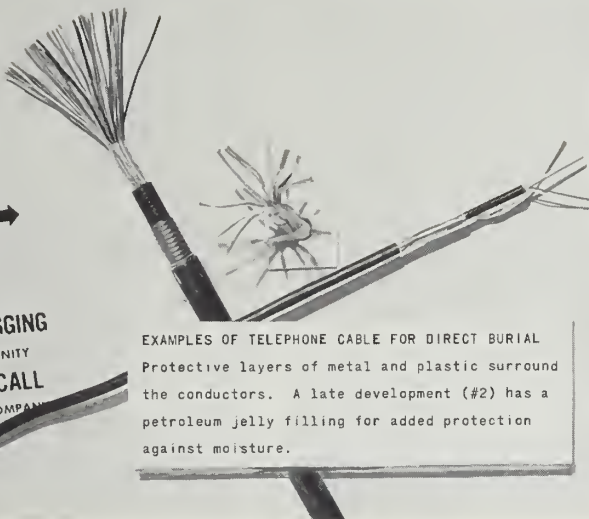
REA engineer performs acoustical test on rural telephone equipment. Manufacturing representatives (bottom) and REA engineers discuss requirements for equipment.

CAUTION
BURIED
CABLE



BEFORE DIGGING
IN THIS VICINITY
PLEASE CALL
TELEPHONE COMPANY

EXAMPLES OF TELEPHONE CABLE FOR DIRECT BURIAL
Protective layers of metal and plastic surround
the conductors. A late development (#2) has a
petroleum jelly filling for added protection
against moisture.



Special cables, designed to withstand the rigors of rural underground construction, developed in cooperation with equipment manufacturers. Compact carrier equipment (bottom) provides one-party service to four subscribers over a single existing circuit. Most recent development allows similar units to be placed within the telephone instrument.

REA engineers are staying abreast of these developments, enabling rural people to share in the inventions of tomorrow. Meanwhile, the primary responsibility of REA telephone engineers is to make certain that new telephone designs and products fit logically into the small rural systems of REA borrowers over the nation.

Today, the latest conveniences of telephone service—once reserved for urban residents alone—are available to most rural people. The average rural telephone system is well equipped to serve the communications needs of its subscribers.

The Typical REA Telephone Borrower

Two out of three REA telephone borrowers are commercial telephone companies—among the 2,000 independent systems in this country. The remaining third are co-operatives. Although parts of some systems may have a history running back many years, the average company has been an REA borrower 12 years.

This average borrower provides service to approximately 2,146 subscribers located in several small towns and the surrounding rural areas. Of these subscribers 70 percent received initial service as a result of REA financing.

The typical borrower has 5 central offices, providing modern dial service over 507 miles of pole line, cable and buried plant. Telephones in service include 2,132 residential and 284 for business. In addition, 18 percent of the subscribers have telephone extensions.

Last year, REA's typical telephone borrower took in \$307,306 in operating revenues, 41 percent of this coming from toll calls. It has borrowed a total of \$1,437,946 in several loans, and has paid \$281,842 in principal and interest on its REA indebtedness. Net worth of the typical borrower stands at an estimated \$289,913.

This typical REA borrower has a modern headquarters building, employs an office and maintenance staff numbering 17 persons, and paid taxes amounting to \$42,540 in 1967.

REA borrowers enjoy the complete cooperation of all segments of the telephone industry, including the Bell System.

From POTS* to Total Communications

The role of the rural telephone system is rapidly changing. Where once POTS or plain old telephone service, was the standard, it must now prepare to assume the responsibility of providing not only voice messages, but data communication, wide-band for picture telephone, video and myriads of other services not dreamed of in the early days of the industry. Subscriber demand and technological development will determine the ultimate extent of these services.

**POTS=Plain Old Telephone Service*



A.



B.

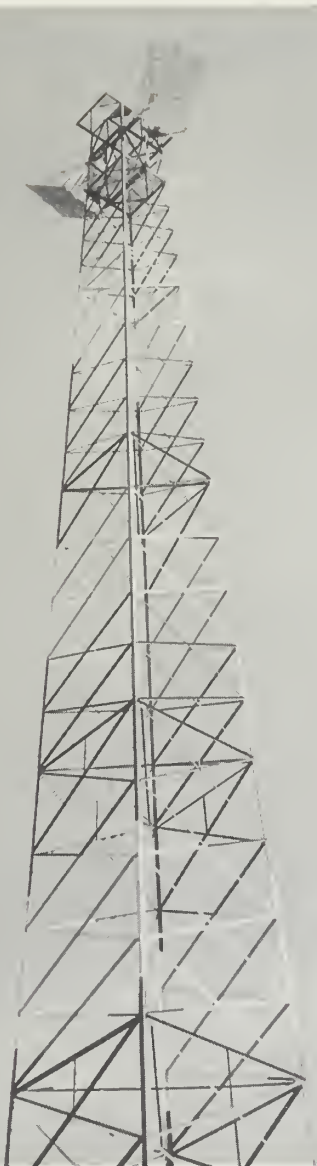


C.

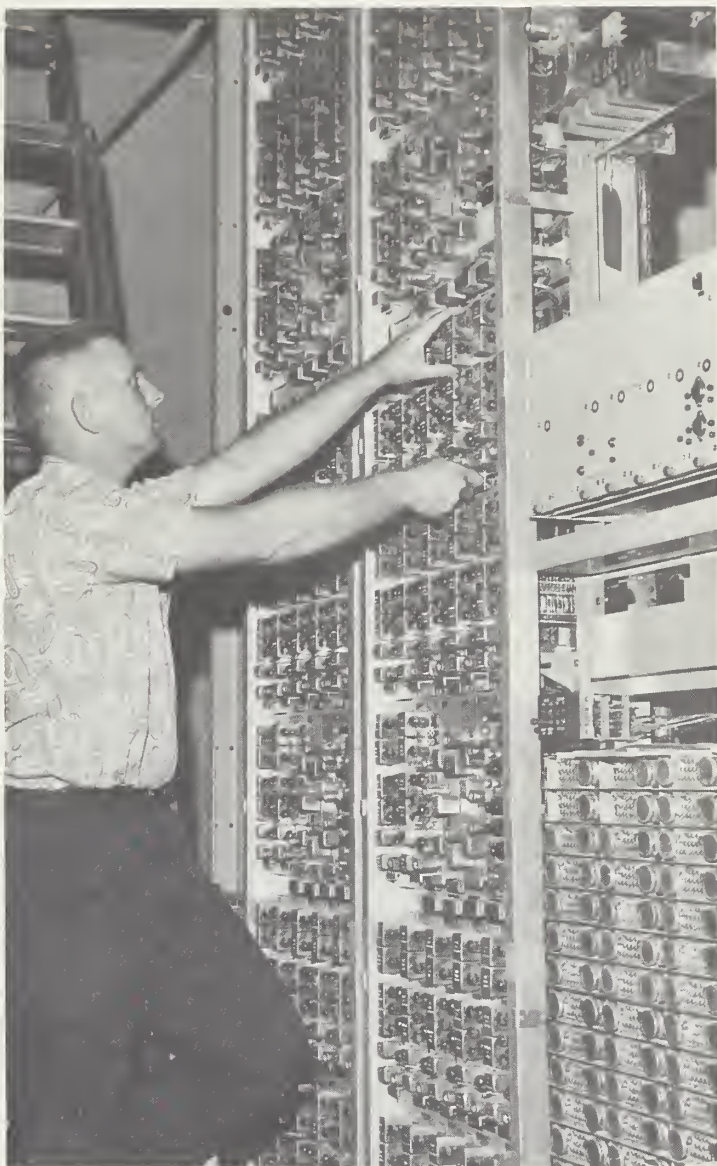


D.

- A. For speed, efficiency and decor, rural subscribers are demanding push-button telephones in a variety of colors and styles.
- B. Small businesses use desk-top PABX switchboards for interoffice communications.
- C. Mobile telephone service helps the farmer, the salesman, the busy subscriber.
- D. "Live" electrocardiograms over regular telephone lines are now beyond the experimental stage.
- E. Microwave relay is often used to tie rural systems in with nationwide telephone facilities.
- F. Toll calls are automatically dispatched through Direct Distance Dialing.
- G. Businesses are linked to computer centers for record preparation, billing and other purposes.



E.



F.



G.

Technical Assistance

To safeguard the security of its loans, and to insure that rural subscribers get the best possible telephone service, REA employs a staff of specialists in engineering, accounting and management.

An REA field telephone accountant, for example, assists borrowers set up and maintain proper accounting procedures. The management and loans specialist helps the borrower solve management problems and prepare detailed REA loan applications. The REA field engineer is available to provide technical assistance to borrowers relative to system planning, construction, maintenance and operation.

To help borrowers meet REA's technical standards, the agency publishes a Telephone Engineering and Construction Manual. Continuously expanded and revised and consisting of some 2,800 pages, this publication is considered by many to be the only complete technical work on general telephony.

The REA field staff meets annually for briefing on the latest technology.



REA's Telephone Operations Manual is designed to assist borrowers set up operating procedures in five major categories: general, plant, traffic, commercial and accounting.

REA also provides special assistance to borrowers who find it hard to get on or stay on the black-ink side of the ledger. When needed, REA personnel assists borrowers prepare comprehensive management studies, and find solutions to management problems.

The agency also helps borrowers increase their revenues. Workshops with borrowers' personnel are conducted by REA instructors in the areas of advertising, promotional activities, and member and public relations.

More than 250 REA technical publications are available to borrowers for these purposes.

In providing help as needed, REA always recognizes the independent character of its borrowers. The agency's guiding policy states that REA "shall render certain technical advice and assistance to its borrowers."

This help, however, "shall progressively diminish as borrowers gain in strength and maturity."

The underlying objective of REA is to move as quickly as possible toward a situation "in which every borrower possesses the internal strength and soundness to guarantee its permanent success as an independent local enterprise."

The REA technical assistance program benefits the entire telephone industry by providing a central listing of material and equipment. In addition, the Agency has assisted in the development of the telephone industries of many other countries by providing information or experience in building rural telephone systems. As in the electrification program, the REA pattern for construction and operation of rural telephone systems is an export item. Assistance and detailed information has been provided to telephone industry personnel from nearly 40 foreign nations, including Canada, West Germany, Brazil, Japan and Lebanon.

A noise-level check of borrowers' lines is made by REA engineers.



Good Telephone Service Means Area Progress

By helping to develop the economic potential of the communities they serve, rural telephone systems build financial and operating strength, thereby benefitting all subscribers. Community development activities include providing leadership and office facilities for area organizations; helping locate sources of credit for aspiring businesses; and continuously updating the service capability of the systems to keep pace with subscriber demand.



A.



D.

- A. By placing service wires underground, telephone systems . . .
- B. . . make entire communities more attractive to potential buyers.
- C. Make office services and employee technical skills available for community projects.
- D. Offer meeting facilities in headquarters buildings to civic and other groups.
- E. Enable local school systems to broaden their scope through educational TV.
- F. Evaluate potential building sites for business development with community leaders.
- G. Keep pace with industry development by employing modern management techniques.



C.



F.



G.

The Record to Date

In two decades, rural telephony has progressed from an antiquated, often unreliable, service for little better than a third of the Nation's farm families, to a highly specialized, modern industry equipped to serve the total communications needs of rural America. Today's rural resident enjoys the same opportunities for good telephone service as does his cousin in the city.

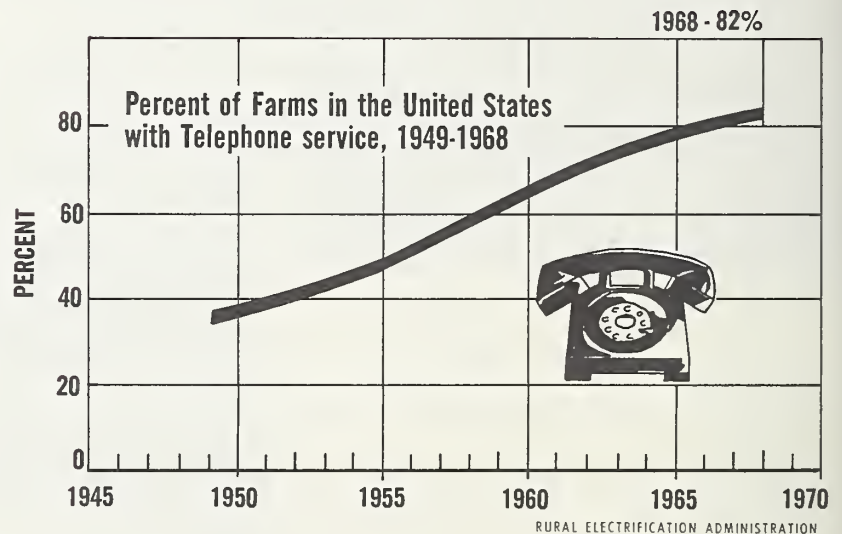
Since the telephone amendment to the Rural Electrification Act became law on October 28, 1949, the number of farms receiving service has risen from 38 percent, to 82 percent. More than 95 percent of this service is dial.

REA has approved loans totaling more than \$1.6 billion during this time, to 636 commercial companies and 231 cooperatives. These funds finance facilities, including over a half million miles of line, to serve the telephone needs of 2.3 million rural subscribers located in 46 states.

But this is only part of the story. Rural telephone borrowers have repaid better than \$180 million of principal to the Government and \$153 million in interest. As of January 1, 1969, borrowers had also made an additional \$22 million in payments of principal ahead of schedule.

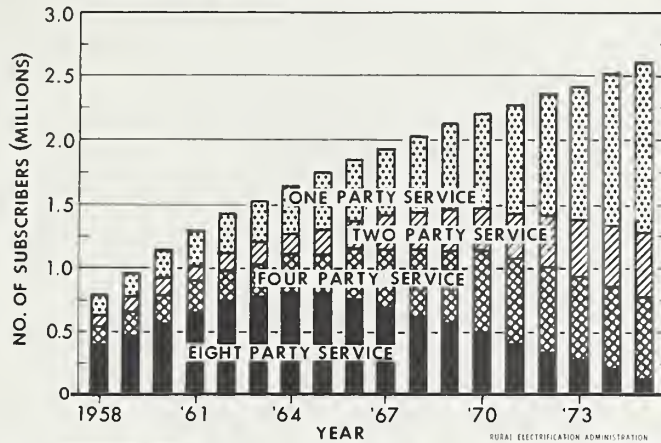
Engineering achievements in the REA telephone program have contributed substantially toward reducing construction costs, thereby enabling more people to enjoy telephone service. Moreover, rural people enjoy a quality of telephone service undreamed of 20 years ago.

Unsightly overhead telephone lines are being placed underground at a rapidly accelerating pace, thus helping beautify the countryside. And breakthroughs in equipment design have changed the goal of all one-party rural telephone service from a futuristic dream, to an achievable reality.

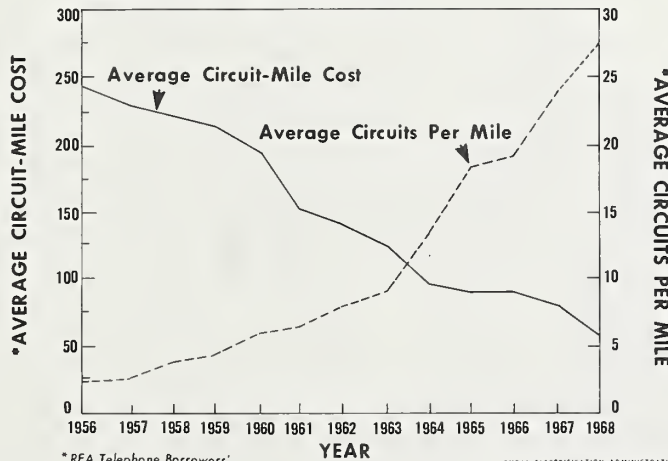


SUBSCRIBER SERVICE DISTRIBUTION, 1958-1975

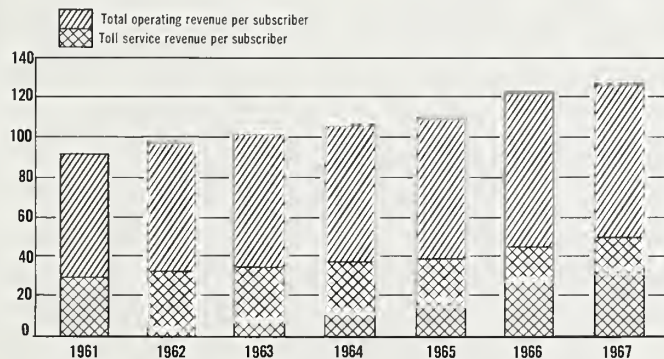
UPGRADING RURAL TELEPHONE SERVICE



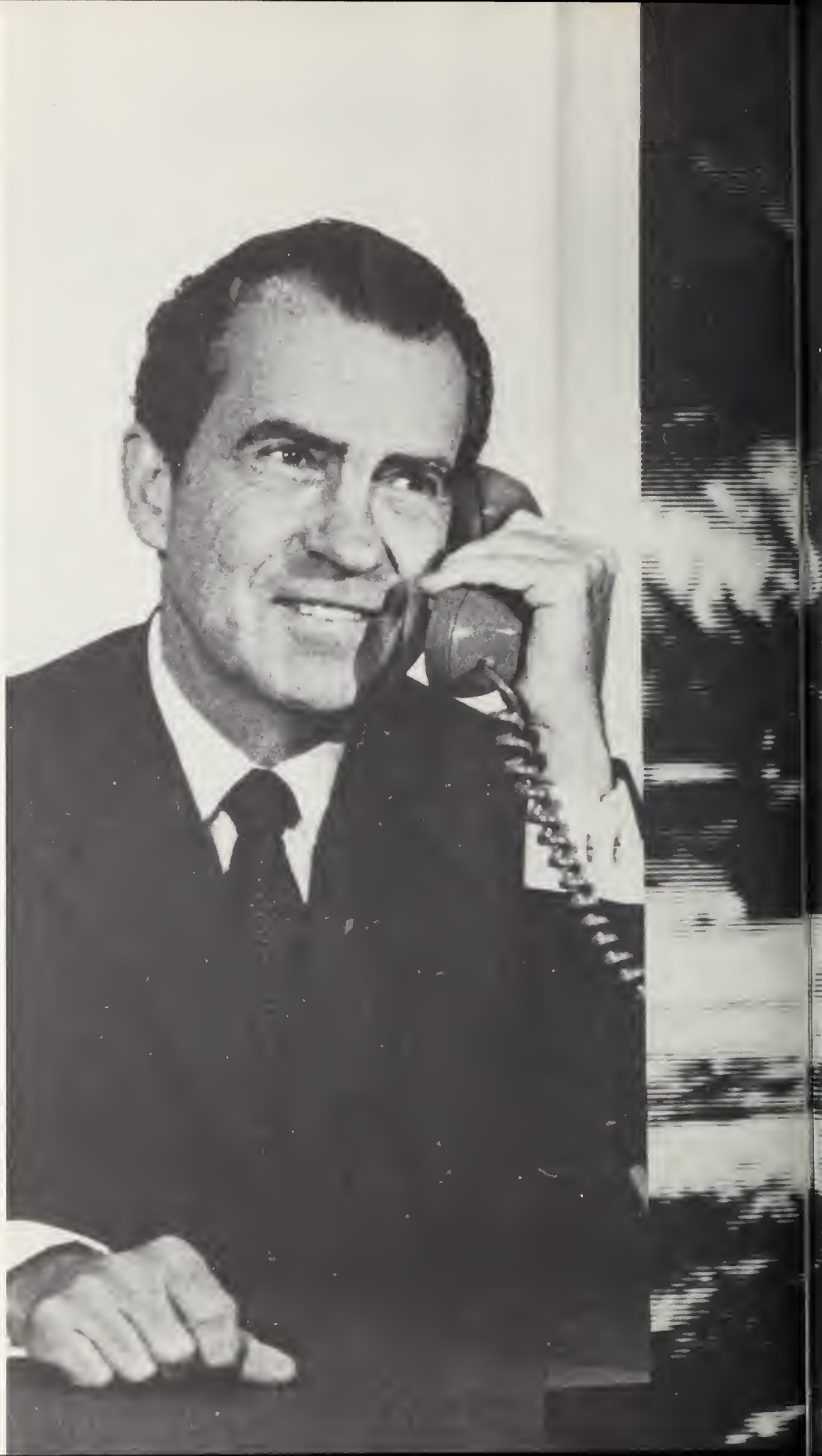
**INCREASE IN CIRCUIT REQUIREMENTS
REDUCES COST PER CIRCUIT MILE**

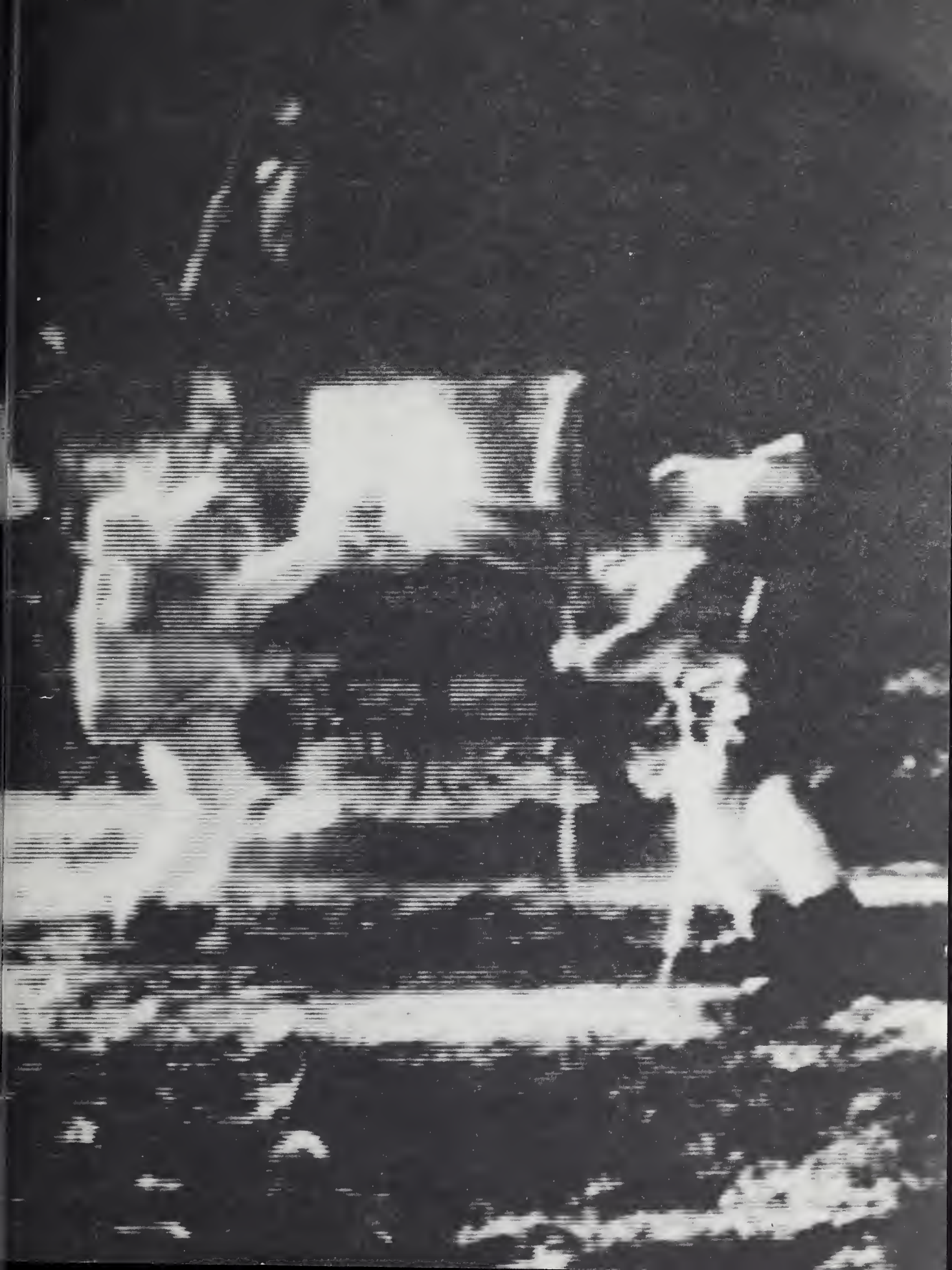


BETTER SERVICE MEANS MORE TOLL CALLS, MORE REVENUE



On July 20, 1969,
President Richard M.
Nixon made history's
longest long-distance
telephone call—from
earth to the moon. The
Rural Electrification
Administration salutes
this dramatization of the
almost unbelievable
advances in communi-
cations in the past
20 years.





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